Greenhouse Management

Curriculum Content Frameworks

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Curriculum Content Framework

GREENHOUSE MANAGEMENT

Grade Level: 10, 11, 12 **Semester** **Prerequisites: None**
Course Code: 491270

Course Description: This course offers the serious horticulture student an indepth study of greenhouse management practices. Structural considerations are covered, as well as plant propagation techniques, pesticide use, and marketing strategies. The student will receive ample opportunity to practice the skills learned during the course.

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Unit 1: Greenhouse Management

5 Hours

Terminology: Entrepreneurship, Floriculture CDE, Greenhouse, Nursery/Landscape CDE, Placement, Proficiency Award

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
1.1 Define greenhouse management terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Personal Management	Responsibility	Exhibits enthusiasm in approaching and completing task [3.4.3]
1.2 Discuss the role greenhouses play in the agricultural industry	1.2.1 Visit greenhouses in the local area to determine what crops are grown	Foundation	Speaking	Asks questions to clarify information [1.5.3]; asks question to obtain information [1.5.4]
		Personal Management	Integrity/Honesty/ Work Ethic	Complies with safety and health rules in a given work environment [3.2.2]; follows established rules, regulations, and policies [3.2.5]
1.3 Identify careers in greenhouse management	1.3.1 Research a career in greenhouse management to determine educational requirements, working conditions, and salary	Foundation	Reading	Uses standard occupational resource materials [1.3.22]
		Personal Management	Career Awareness Development, & Mobility	Develops skills to locate, evaluate, and interpret career information [3.1.4]; identifies education and training needed to achieve goals [3.1.8]
1.4 Discuss the FFA opportunities for students interested in greenhouse management		Foundation	Writing	Writes logical and understandable sentences [1.6.23]
		Interpersonal	Leadership	Encourages/Motivates members of a group or team [2.4.6]; organizes group in planning and performing a specific task [2.4.9]

Unit 2: Basic Greenhouse Styles

5 Hours

Terminology: Anchor support posts, Even span, Glass, Gothic arch, Plastic coverings, Polyethylene, Purlins, Quonset, Ridge, Rigid sheet plastic, Trusses, Uneven span, Ventilators

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
2.1 Name basic greenhouse styles	2.1.1 Identify greenhouse styles in the community	Foundation	Reading	Adjusts reading strategy to purpose and type of reading (skimming and scanning) [1.3.1]
		Thinking	Seeing Things in the Mind's Eye	Organizes and processes images—symbols, pictures, graphs, objects, etc. [4.6.2]
2.2 List examples of the uses of greenhouse ranges in commercial greenhouse production		Foundation	Reading	Identifies relevant details, facts, and specifications [1.3.16]
		Personal Management	Organizational Effectiveness	Identifies characteristics desired by organization [3.3.6]
2.3 Compare the basic types of greenhouse coverings		Foundation	Writing	Presents own opinion in written form in a clear, concise manner [1.6.14]
		Thinking	Decision Making	Evaluates information/data to make best decision [4.2.5]
2.4 List common framing materials used for greenhouses		Foundation	Reading	Locates pertinent information in documents, such as manuals, graphs, and schedules, to perform tasks [1.3.18]
		Thinking	Know how to Learn	Locates appropriate learning resources to acquire or improve knowledge and skills [4.3.4]

Unit 3: Greenhouse Systems

10 Hours

Terminology: Capillary mat system, Fan-and-pad cooling system, Fan-tube ventilation, Fog-evaporative cooling system, Forced-air heaters, Hose watering, Infrared radiant heaters, Natural ventilation, Overhead, Perimeter irrigation, Soaker hose system, Tube irrigation

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
3.1 Compare commonly used heating systems		Foundation	Listening	Comprehends ideas and concepts related to heating systems [1.2.1]
		Thinking	Decision Making	Demonstrates decision-making skills [4.2.4]
3.2 Discuss commonly used cooling systems		Foundation	Speaking	Asks questions to clarify information [1.5.3]; responds to listener feedback [1.5.10]
		Thinking	Seeing Things in the Mind's Eye	Visualizes a system's operation from schematics [4.6.3]
3.3 Compare commonly used ventilation systems		Foundation	Reading	Identifies relevant details, facts, and specifications [1.3.16]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]
3.4 Describe commonly used watering systems	3.4.1 Visit greenhouses to observe various systems in operation	Foundation	Writing	Communicates thoughts, ideas, or facts in written form in a clear, concise manner [1.6.6]
		Personal Management	Integrity/Honesty/ Work Ethic	Follows established rules, regulations, and policies [3.2.5]

Unit 4: Supporting Structures

10 Hours

Terminology: Cold frame, Hotbed

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
4.1 Describe the use of hotbeds		Foundation	Writing	Summarizes written information [1.6.17]
		Thinking	Creative Thinking	Finds new ways of dealing with existing problems/situations [4.1.5]
4.2 Discuss the uses of cold frames	4.2.1 Build a cold frame	Foundation	Science	Applies knowledge to complete a practical task [1.4.3]
		Interpersonal	Teamwork	Works effectively with others to reach a common goal [2.6.6]
		Personal Management	Organizational Effectiveness	Applies knowledge to implement work-related system or practice [3.3.4]
4.3 Describe the uses of shade structures		Foundation	Reading	Applies information and concepts derived from printed materials [1.3.3]
		Thinking	Problem Solving	Demonstrates logical reasoning in reaching a conclusion [4.4.2]

Unit 5: Greenhouse Coverings

5 Hours

Terminology: **Glass, Nonrigid plastic, Rigid plastic**

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
5.1 Compare the advantages and disadvantages of glass as a covering		Foundation	Reading	Identifies relevant details, facts, and specifications [1.3.16]
		Thinking	Decision Making	Considers risks when making a decision [4.2.3]
5.2 Describe the advantages and disadvantages of nonrigid plastic as a covering	5.2.1 Evaluate current trends in the industry	Foundation	Speaking	Participates in conversations, discussion, and group presentations [1.5.8]
		Thinking	Decision Making	Identifies pros and cons to assist in decision-making process [4.2.7]
5.3 Analyze the advantages and disadvantages of rigid plastic as a covering	5.3.1 Peruse greenhouse supply catalogs to compare costs of various materials	Foundation	Reading	Uses appropriate materials and techniques as specified [1.3.20]; uses graphs/charts/tables to obtain factual information [1.3.21]
		Thinking	Reasoning	Uses logic to draw conclusions from available information [4.5.6]

Unit 6: Sexual Propagation of Plants

10 Hours

Terminology: Asexual, Bark, Dormancy, Germination, Peat moss, Perlite, Sand, Scarification, Sexual, Stratification, Vermiculite

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
6.1 Define propagation terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information
			Writing	Uses words appropriately [1.6.21]; writes/prints legibly [1.6.24]
6.2 List the two types of plant propagation		Foundation	Reading	Adjusts reading strategy to purpose and type of reading (skimming and scanning) [1.3.1]
		Thinking	Know how to Learn	Processes new information as related to workplace [4.3.5]
6.3 List the environmental factors necessary for germination		Foundation	Science	Describes/Explains scientific principles related to germination [1.4.4]
		Thinking	Reasoning	Applies rules and principles to a new situation [4.5.1]
6.4 Cite the characteristics of a good germination medium	6.4.1 Germinate seeds	Foundation	Speaking	Pronounces words correctly [1.5.9]; speaks in a clear, concise manner [1.5.12]
		Thinking	Problem Solving	Draws conclusions from observations, evaluates conditions, and give possible solutions [4.4.5]

Unit 7: Working with Seedlings
10 Hours

Terminology: Damping off, Transplanting

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
7.1 Define terms		Foundation	Reading	Uses written resources (books, dictionaries, directories) to obtain factual information [1.3.23]
		Thinking	Problem Solving	Identifies possible reasons for problems [4.4.6]
7.2 Explain the importance of using sterilized media for seedlings		Foundation	Science	Observes health code/sanitation requirements [1.4.19]
		Personal Management	Organizational Effectiveness	Comprehends the organization's modes of operation [3.3.5]
7.3 Explain the importance of proper stage of growth for transplanting seedlings	7.3.1 Transplant seedlings	Foundation	Speaking	Speaks effectively using appropriate eye contact, gestures, and posture [1.5.11]
		Interpersonal	Teamwork	Demonstrates understanding, friendliness, adaptability, empathy, and politeness in new and ongoing group settings [2.6.3]

Unit 8: Asexual Propagation Methods

20 Hours

Terminology: Air layering, Cloning, Crown, Cutting, Disinfectant, Division, Girdling, Grafting, Growth regulator, Layering, Leaf bud cutting, Leaf cutting, Propagation, Root cutting, Stem cutting, Stock plant, Tissue culture, Vegetative

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
8.1 Explain how cuttings are taken	8.1.1 Demonstrate the correct procedures for taking and rooting cuttings	Foundation Thinking	Reading Know how to Learn	Interprets drawing to obtain factual information [1.3.7] Uses available resources to apply new skills [4.3.6]
8.2 Outline the process involved in division of plants	8.2.1 Demonstrate the correct procedures for division of plants	Foundation Thinking	Writing Reasoning	Adapts notes to a proper form [1.6.1] Applies rules and principles to a new situation [4.5.1]
8.3 Compare the types of layering	8.3.1 Demonstrate the correct procedure for layering	Foundation Thinking	Reading Seeing Things in the Mind's Eye	Locates pertinent information in documents, such as manuals, graphs, and schedules, to perform tasks [1.3.18] Imagines the flow of work activities from narrative descriptions [4.6.1]; visualizes a finished product [4.6.1]
8.4 Discuss the effect of tissue culture on the greenhouse industry	8.4.1 Perform a tissue culture	Foundation Thinking	Science Integrity/Honesty/ Work Ethic	Follows safety guidelines [1.4.16]; observes health code/sanitation requirements [1.4.19] Complies with safety and health rules in a given work environment [3.2.2]

Unit 9: Pesticide Use

5 Hours

Terminology: Antidote, Fungicide, Herbicide, Insecticide, LD factor, Miticide, Nematocide, Pest, Pesticide, Toxicity

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
9.1 Define pesticide terms		Foundation	Reading	Applies/Understands technical words that pertain to subject [1.33.6]
		Thinking	Know how to Learn	Develops personal learning strategies—note taking, clustering related items, flash cards, etc. [4.3.2]
9.2 List the proper equipment and clothing to use when applying pesticides		Foundation	Science	Follows safety guidelines [1.4.16]
		Personal Management	Integrity/Honesty/ Work Ethic	Follows established rules, regulations, and policies [3.2.5]
9.3 Explain the importance of pesticide label information	9.3.1 Analyze pesticide labels to determine toxicity and directions for use	Foundation	Reading	Uses graphs/charts/tables to obtain factual information [1.3.21]
		Thinking	Reasoning	Extracts rules or principles from written information [4.5.4]; uses logic to draw conclusions from available information [4.5.6]

Unit 10: Marketing Greenhouse Crops

10 Hours

Terminology: Broker, Consumer, Markup, Producer, Retailer, Seasonal market, Wholesaler

CAREER and TECHNICAL SKILLS What the Student Should Be Able to Do		ACADEMIC and WORKPLACE SKILLS What the Instruction Should Reinforce		
Knowledge	**Application**	**Skill Group**	**Skill**	**Description**
10.1 Discuss the factors to consider in selecting greenhouse crops	10.1.1 Determine greenhouse crops that would sell well in the local area	Foundation Interpersonal	Speaking Customer Service	Participates in conversation, discussion, and group presentations [1.5.8] Comprehends ideas and concepts related to customer demands [2.3.2]
10.2 Determine retail prices for greenhouse products		Foundation Personal Management	Arithmetic/ Mathematics Integrity/Honesty/ Work Ethic	Figures percentages to determine sales prices [1.1.49] Describes/Explains significance of integrity, honesty, and work ethic
10.3 Explain seasonal markets for greenhouse crops	10.3.1 Develop a calendar showing yearly greenhouse crop rotations	Foundation Thinking	Writing Problem Solving	Composes and creates documents—letters, manuals, reports, proposals, graphs, flow charts, etc. [1.6.8] Devises and implements a plan of action to resolve problem [4.4.3]

Unit 1: Greenhouse Management

1. Entrepreneurship—working for oneself
2. Floriculture CDE—an FFA Career Development Event that allows for competition in the different aspects of floriculture
3. Greenhouse—a structure that is covered with a transparent material that allows sufficient sunlight to enter for the purpose of growing and maintaining plants
4. Nursery/Landscape CDE—an FFA Career Development Event that allows for competition in the different aspects of Nursery/Landscaping
5. Placement—working for someone else
6. Proficiency Award—an award for someone's SAE

Unit 2: Basic Greenhouse Styles

1. Anchor support posts—side posts providing the main structural support for a greenhouse that are spaced at regular intervals and set in concrete footings
2. Even span—a basic style of greenhouse in which rafters are equal in length
3. Glass—a type of covering used in greenhouses; comes in several grades; allows greatest transmission of light
4. Gothic arch—basic style of greenhouse with a pointed arch; trusses have been eliminated
5. Plastic coverings—a type of covering used in greenhouses; more flexible than glass; costs less than glass
6. Polyethylene—a petroleum-based flexible plastic used for many purposes; greenhouses can be covered with this
7. Purlins—run the length of the structure and are attached to each truss, adding more structural strength
8. Quonset—basic style of greenhouse with curved roof with or without sidewalls
9. Ridge—the top (highest point)
10. Rigid sheet plastic—a type of covering used in greenhouses; it is rigid and resistant to weathering
11. Trusses—composed of rafters, chords, and struts that support the roof
12. Uneven span—basic style of greenhouse in which rafters are of unequal length
13. Ventilators—moveable units of a greenhouse to allow for natural air flow

Unit 3: Greenhouse Systems

1. Capillary mat system—a form of subirrigation in which potted plants are set on a moist synthetic mat and water moves upward through the drain holes into the growing medium by wick action

2. Fan-and-pad cooling system—a system in which large exhaust fans draw air through a moistened cellulose pad mounted on the opposite end of the structure

3. Fan-tube ventilation—fans bring in small amounts of cool outside air and mix it with the warm air

4. Fog-evaporative cooling system—fog is generated inside; as the minute fog droplets evaporate, heat is absorbed

5. Forced air-heaters—localized heater units that force hot air directly into a duct system

6. Hose watering—manual watering of plants

7. Infrared radiant heaters—individual heater units that produce infrared radiation

8. Natural ventilation—air is exchanged through open ridge and side vents and controlled by thermostats

9. Overhead—water is applied over the canopy of the plants with spray nozzles

10. Perimeter irrigation—watering around the outside of a flower bed

11. Soaker hose system—water is applied to the growing medium by slowly saturating the medium

12. Tube irrigation—water is carried to each pot by a microtube; foliage is not wet in this process

Unit 4: Supporting Structures

1. Cold frame—an outside propagation structure consisting of a wooden or concrete block frame with heat supplied by solar radiation through a glass or other transparent covering

2. Hotbed—an outside propagation structure similar to a cold frame except electric or hot water thermostatically controlled heating is used

Unit 5: Greenhouse Coverings

1. Glass—a type of covering used in greenhouses; comes in several grades; allows greatest transmission of light
2. Nonrigid plastic—flexible plastic covering used in greenhouses; more flexible than glass; costs less than glass
3. Rigid sheet plastic—a type of covering used in greenhouses; rigid and resistant to weathering

Unit 6: Sexual Propagation of Plants

1. Asexual—process of reproducing plants without seeds (also called vegetative)
2. Bark—used as a substitute for peat moss or in combination with peat; aged hardwood or pine is best
3. Dormancy—the phase in the life cycle of a plant when growth is slowed or inactive
4. Germination—the resumption of growth by a seed embryo; occurs when the embryonic root emerges from the seed coat
5. Peat moss—a moss plant that grows on peat bogs, such as *Sphagnum* or *Polytrichum*
6. Perlite—a heat-treated lava rock that is lightweight with low nutrient and moisture holding capacity
7. Sand—used to increase aeration and drainage
8. Scarification—breaking or softening a seed coat to allow absorption of moisture
9. Sexual—reproduction using seeds
10. Stratification—placing seeds in a moist soil medium at a temperatures between 32 degrees and 50 degrees for a certain period of time
11. Vermiculite—heat-treated mica that is lightweight and has high nutrient and moisture holding content

Unit 7: Working with Seedlings

1. Damping off—a fungal disease that causes the stems to rot off at the soil line

2. Transplanting—transferring or moving seedlings from the seedbed and setting them into the ground

Unit 8: Asexual Propagation Methods

1. Air layering—a type of layering in which the stem is girdled, the cut is dusted in rooting hormone, and the dusted cut is covered with moss
2. Cloning—genetically generating offspring from nonsexual tissue
3. Crown—part of the plant that enters the soil
4. Cutting—vegetative plant part that regenerates roots and forms new plants
5. Disinfectant—a material that destroys infective agents such as bacteria and viruses
6. Division—a method of vegetative propagation involving separation of a plant into two or more pieces, each containing a portion of the roots and crown
7. Girdling (wounding)—restricts the function of the xylem or phloem of a dicot plant
8. Grafting—implanting a branch or bud from one plant onto another
9. Growth regulator—a substance that influences plant growth
10. Layering—a method of propagating; a shoot is bent to the ground, held in place with a wire loop or stone, and covered with soil; after it generates roots, it is severed from the parent plant
11. Leaf bud cutting—a cutting that includes a short section of stem with a leaf attached
12. Leaf cutting—a cutting made from a leaf and its attached petiole
13. Propagation—the process of increasing the numbers of a species
14. Root cutting—a cutting made from sections of roots
15. Stem cutting—a cutting made from short pieces of thickened leafless stems containing at least one node
16. Stock plant—a plant from which cuttings or meristems are obtained for propagation
17. Tissue culture—plant reproduction using very small, actively growing plant parts under sterile conditions and medium
18. Vegetative—a method of reproduction that involves plant parts other than the reproductive ones

Unit 9: Pesticide Use

1. Antidote—a substance given to counteract the effect of a toxin
2. Fungicide—a material used to destroy fungi or protect plants against their attack
3. Herbicide—a substance that kill weeds
4. Insecticide—a material used to kill insects or protect against their attacks
5. LD factor—lethal dose factor
6. Miticide—a chemical used to control mites
7. Nematocide—a chemical used to control nematodes
8. Pest—an unwanted plant or animal
9. Pesticide—a chemical used to control pests
10. Toxicity—a measurement of how poisonous a chemical is

Unit 10: Marketing Greenhouse Crops

1. Broker—a person who sells
2. Consumer—a person who buys
3. Markup—the difference in the price the object costs to produce and the cost it is sold for
4. Producer—the person who grows a plant for sale
5. Retailer—a person or store that sells directly to the consumer
6. Seasonal market—a market that is affected by weather, time of year, or holidays
7. Wholesaler—a person who sells to a retailer